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Confirmation No. 1786

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appellant:	VAN BEZOOIJEN	Examiner:	Chan, R.
Serial No.:	10/527,775	Group Art Unit:	2618
Filed:	March 14, 2005	Docket No.:	NI.020886US
Title:	PRESERVING LINEARITY OF A RF POWER AMPLIFIER		

CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence and the papers, as described hereinabove, are being transmitted via facsimile-Formal Entry, to the attention of the Examiner at Commissioner for Patents, MAIL STOP APPEAL BRIEF, P.O. Box 1450, Alexandria, VA 22313-1450, On September 7, 2007

Facsimile No.: 571 273-8300

By:

Kelly Davis

APPEAL BRIEF

Mail Stop Appeal Brief-Patents
Commissioner For Patents
P.O. Box 1450
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Customer No.
65913

Dear Sir:

This Appeal Brief is submitted pursuant to 37 C.F.R. §41.37, in support of the Notice of Appeal filed July 23, 2007 and in response to the rejections of claims 1-20 as set forth in the Final Office Action dated March 30, 2007, and in further response to the Advisory Action dated July 3, 2007.

Please charge Deposit Account number 50-0996 (NXPS.203PA) \$500.00 for filing this brief in support of an appeal as set forth in 37 C.F.R. §1.17(c). If necessary, authority is given to charge/credit Deposit Account 50-0996 (NXPS.203PA) additional fees/overages in support of this filing.

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claims depends) as required (see M.P.E.P. § 2142). As discussed in Section E of Appellant's Argument, the § 103(a) rejection of any claim (based upon the Chen reference) that depends from claim 1 is improper and should be reversed.

VIII. Conclusion

In view of the above, Appellant submits that the rejection of claims 1-20 are improper. Appellant therefore requests reversal of the rejections as applied to the appealed claims and allowance of the entire application.

Authority to charge the undersigned's deposit account was provided on the first page of this brief.

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I. Real Party In Interest

The real party in interest is NXP Semiconductors. The application is presently assigned of record, at recl/frame nos. 016978/0242 to Koninklijke Philips Electronics, N.V., headquartered in Eindhoven, the Netherlands. We have been authorized by both the assignee of record and NXP Semiconductors to convey herein that the entire right, title and interest of the instant patent application have been transferred to NXP Semiconductors.

II. Related Appeals and Interferences

While Appellant is aware of other pending applications owned by the above-identified Assignee, Appellant is unaware of any related appeals, interferences or judicial proceedings that would have a bearing on the Board's decision in the instant appeal.

III. Status of Claims

Claims 1-20 stand rejected. Accordingly, claims 1-20 are presented for appeal. A complete listing of the claims under appeal is provided in an Appendix to this Brief.

IV. Status of Amendments

No amendments have been filed subsequent to the Office Action dated March 30, 2007. All presented amendments have been entered.

V. Summary of Claimed Subject Matter

The present claims recite methods and circuits for preserving linearity of a RF power amplifier, in particular by operating a RF power output unit below its saturation level.

Independent claim 1 recites a method, and independent claim 12 recites a circuit, for preserving linearity of a RF power amplifier (see, for example, Figs. 4 and 5 and the accompanying text on page 9, line 19 through page 10, line 34). In the recited method and circuit, the power amplifier includes a RF power output unit (e.g., the collector terminal of transistor 4 of Fig. 4 or transistor 24 of Fig. 5) having a characteristic drive level (e.g., provided by driver 2 of Fig. 4 or driver 22 of Fig. 5) and fed by a supply voltage (e.g., V_{sup} through inductance 6 of Fig. 4 or inductance 26 of Fig. 5). In the recited method and circuit,

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the output voltage of the RF power output unit is measured (e.g., in Fig. 4 the collector voltage of transistor 4 is detected by threshold detection unit 16, and in Fig. 5, the collector voltage of transistor 24 is detected by threshold detection unit 36), and the measured output voltage is compared to at least one threshold voltage to produce a control signal (e.g., in Fig. 4 op amp 14 compares the output voltage to a reference voltage, and in Fig. 5 op amp 34 compares the output voltage to a reference voltage). The control signal can be used to reduce the drive level (e.g., in Fig. 4 the output of op amp 14 is fed to the addition point 18, which forms a differential signal that is fed to the driver 2) in a manner such that the output unit is operated below its saturation level for preserving linearity. The control signal can also be used to increase the supply voltage (e.g., in Fig. 5 the output of op amp 34 is fed to a base band controller 38 that controls a DC/DC converter 40 so that below a given threshold the supply voltage of the RF power output unit can be increased) in a manner such that the output unit is operated below its saturation level for preserving linearity.

Independent claim 4 recites a method, and independent claim 15 recites a circuit, for controlling and stabilizing an antenna circuit (see, for example, the antenna circuit of Fig. 7 along with the accompanying text on page 12, lines 5 through 29), where the antenna circuit includes a RF power amplifier and a matching circuit (e.g., matching circuit 70 of Fig. 7). The RF power amplifier has a characteristic drive level (e.g., provided by driver 56 in Fig. 7) and is fed by a supply voltage source (e.g., supply voltage V_{sup} through inductance 60 in Fig. 7). The output voltage of the RF power output unit is measured (e.g., threshold detector 68 of Fig. 7 detects the collector voltage) and compared to at least one threshold voltage to produce a control signal (e.g., op amp 66 of Fig. 7 compares the collector voltage to a reference voltage, and produces a control signal). The control signal is used to adapt the output matching circuit (e.g., matching circuit 70 of Fig. 7 can be adapted by changing the magnitude or phase of impedance information between the output/input impedance of the transistor 62 and the input/output impedance of the antenna 72, as discussed on page 12, lines 18-22) to thereby operate the output unit below its saturation level.

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VI. Grounds of Rejection to be Reviewed Upon Appeal

- A. Claims 1 and 12 stand finally rejected under 35 U.S.C. § 102(b) over Camp, Jr. (U.S. 6,191,653).
- B. Claims 4-5, 8, 15-16, 18 and 20 stand finally rejected under 35 U.S.C. § 102(b) over Chen (U.S. 6,980,780).
- C. Claims 2-3 and 13-14 stand finally rejected under 35 U.S.C. § 103(a) over Camp Jr. in view of Chen.
- D. Claim 6 stands finally rejected under 35 U.S.C. § 103(a) over Chen in view of Ichikawa (U.S. 6,532,357).
- E. Claims 7 and 17 stand finally rejected under 35 U.S.C. § 103(a) over Chen in view of Tsuji (U.S. 6,725,027).
- F. Claims 9-10 and 19 stand finally rejected under 35 U.S.C. § 103(a) over Chen in view of Nishihori (U.S. 6,134,424).
- G. Claim 11 stands finally rejected under 35 U.S.C. § 103(a) over Chen in view of Kurokawa (U.S. 6,678,507).

VII. Argument

With respect to the various rejections, the Examiner has improperly construed the teachings of the references, failed to provide *prima facie* cases to support the §§ 102(b) and 103(a) rejections, and not responded to the substance of Appellant's arguments. In order to sustain the Examiner's rejections, all the elements of Appellant's claims must be identified in the recited references, whether individually or in the various proposed combinations. In each and every ground for rejection, the Examiner has failed to so identify all the elements of Appellant's claims. For these reasons, as further detailed in the discussions that follow, Appellant respectfully submits that the claimed invention is allowable over the cited references, and requests that the Board fully reverse the various rejections.

A. Rejection of claims 1 and 12 under 35 U.S.C. § 102(b) over Camp

Claims 1 and 12 recite a method and circuit for preserving linearity of a RF power amplifier by producing a control signal and using the control signal to operate the RF power

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unit below its saturation level. In other words, a feedback loop is formed whereby the output of the RF power unit is measured and compared to a threshold to produce the control signal that is in turn used to control the RF power unit so that it is operated below its saturation level.

The Examiner argues that Camp discloses all the elements of claims 1 and 12, in particular pointing to Fig. 1 of Camp where a power detector 42 measures the output power of a power amplifier 32, the detected power being converted and compared to a magnitude function module 22, at which point a correction table 34 is used to apply corrections that are fed back into the power amplifier 32. The Examiner concludes from this simple recitation of Camp's circuit that Camp teaches Appellant's invention. However, the Examiner's analysis ignores the fact that (1) the power amplifier 32 that Camp discloses to be part of the feedback loop is always operated at saturation (see, e.g., Col. 3:53-56), and (2) the RF driver stage 30 that drives the power amplifier 32 is not part of the feedback loop. As such, Camp cannot be said to disclose a control signal that is used to operate a power unit below saturation because the only two power amplifiers disclosed by Camp are either always operated at saturation or not part of the feedback control loop.

The Camp reference is further deficient in that it does not disclose a control signal that is produced from comparing an output voltage to a reference voltage and that is then utilized to reduce the drive level of the power output unit as recited in Appellant's claims. The Examiner merely cites to portions of the Camp reference that disclose using a RF driver stage 30 to supply a signal that drives a power amplifier 32, and that disclose a power detector 42 to measure the power level outputted by the power amplifier 32 (see, e.g., Camp's Fig. 1, Col. 4:17-33 and Col. 5:65 to Col. 6:6). Far from supporting the Examiner's arguments, these portions of the Camp reference disclose a circuit in which the signal used to control the output of an RF driver stage 30 is derived from the signal generated by a waveform generator 14, and not from the power measured by a power detector circuit 42 as asserted by the Examiner. There is nothing in Camp to teach or suggest that any signal is provided from the power detector 42 to the RF driver stage 30 (see, e.g., Fig. 4 and the related discussion), as is required in Appellant's claims.

Thus, the Examiner has improperly construed the teachings of the Camp reference and in doing so has failed to address the claimed limitations as a whole as is required. In particular,

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the Examiner has made no credible finding that Camp discloses either (a) using a control signal to operate a RF power output unit below its saturation level, or (b) using a control signal to reduce the drive level of the RF power output unit, in the manner claimed by Appellants. Accordingly, the § 102(b) rejections of claims 1 and 12 over Camp are improper and should be reversed.

B. Rejection of claims 4-5, 8, 15-16, 18 and 20 under 35 U.S.C. § 102(b) over Chen

The rejection of claims 4-5, 8, 15-16, 18 and 20 as allegedly anticipated by Chen fails on several counts.

First, the independent claims 4 and 15 recite preserving linearity of a RF power amplifier in an antenna circuit. In contrast, the Chen reference discloses a method for disabling an amplifier, and thus, operating the amplifier in a nonlinear mode. More specifically, and in reference to Fig. 2, Chen discloses that when the output power of a driver stage amplifier 21 is lower than a predetermined threshold value, the radio frequency signal RF_{In} is attenuated in response to the attenuation signal V_E such that it is not strong enough to drive the drive stage amplifier 21 (see, e.g., Chen Col. 3:25-38). "Thus, each stage amplifier of the power controller 10 does not output any power, thereby saving the energy" (Chen Col. 3:38-40). Appellant submits that Chen's teaching of attenuating the input signal of driver stage amplifier 21 to save energy does not correspond to preserving the linearity of the RF amplifier as in the claimed invention.

In partial response to these arguments, the Examiner stated that the recitation of "preserving linearity of a RF power amplifier" has not been given patentable weight because it occurs in the preamble of the claims. Appellant submits that this occurrence within preamble is superfluous because claim 15 clearly recites in the body of the claim: "adapting the drive level of the RF power output unit to operate the RF output unit below its saturation level for preserving linearity of the RF power amplifier." Should such preamble recitation in claim 4 breathe life and meaning into the claim, the claim further is distinguishable.

Second, Appellant submits that the Examiner has failed to demonstrate any correspondence between the teachings of Chen and Appellant's claim recitations directed to adapting the matching circuit. The Examiner has cited to Chen Col. 3:7-17 for support, but

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these passages along with the teachings of Chen as a whole clearly fail to disclose any type of adaptation of the matching circuits. Rather, it appears that the portions of Chen identified by the Examiner are directed to modifying the bias voltage for the various amplifier stages as opposed to adapting the matching circuits themselves as specifically recited in Appellant's claims.

Third, the Chen reference fails to include any teaching that would correspond to the recitations of Appellant's claims 5 and 16 (depending from claims 4 and 15, respectively) directed to adapting the output matching circuit by changing either the magnitude or the phase of the impedance transform function. Appellant has found no mention in Chen that would correspond to adapting either the magnitude or the phase of an impedance transform function. As best understood by Appellant, it appears that the Examiner is attempting to equate modification of the bias voltage to amplifier stages 21, 22 and 23 (see Chen Fig. 2) to Appellant's recitation of the matching circuit being adapted (or configurable to be adapted) with respect to the magnitude or phase of the impedance transform function. Appellant submits that the modification of an amplifier's bias voltage does not correspond to the claimed recitations directed to adapting the magnitude or phase of an impedance transform function relative to a matching circuit. Even assuming for the sake of argument that the DS1 and DS3 signals (see Chen Fig. 2) change the magnitude of the amplified signal by adapting the amplifier, there is no correspondence to the claimed recitations because there is no matching circuit adapted with respect to the magnitude or phase of an impedance transfer function.

Fourth, the Chen disclosure includes no teaching to correspond to the recitations of Appellant's claims 8 and 18 that are directed to the output voltage of the RF power output unit being compared to the threshold voltage by means of an operational amplifier. While the Examiner has identified item 52 of Chen's Fig. 2 as corresponding to the operational amplifier of the claimed invention, Appellant notes that the Chen reference refers instead to item 55 of Fig. 2 as the comparator (see, e.g., Chen Col. 3:27-31). Chen does not teach that item 52 performs any comparison function, and therefore item 52 cannot be said to correspond to the operational amplifier of the claimed invention.

Fifth, the Chen reference cannot be said to anticipate claim 8 (dependent on claim 1) or claims 18 or 20 (both dependent on claim 12) because the Examiner has failed to show correspondence between the Chen reference and the limitations of either independent claim 1

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or independent claim 12. Only the Camp reference, and not the Chen reference, has been alleged by the Examiner as anticipating claims 1 and 12. Nowhere does the Examiner provide any further elaboration regarding the possible correspondence of Chen with the elements of claims 1 or 12. Without such a showing, using Chen as an anticipatory reference in the rejection of any claim that depends from claims 1 or 12 is improper.

For all of these reasons, the § 102(b) rejections of claims 4-5, 8, 15-16, 18 and 20 over Chen should be reversed.

C. Rejection of claims 2-3 and 13-14 under 35 U.S.C. § 103(a) over Camp in view of Chen

Contrary to the requirements for sustaining an obviousness rejection using a combination of references, the Examiner has not shown that the resulting combination teaches all the elements recited in the claimed invention.

The Examiner has not met the burden of finding all the claimed elements in the proposed combination, and the proposed combination would result in a circuit which would not function either as claimed by Appellants or in the manner taught by the references.

Claims 2 and 3 depend from claim 1, and claims 13 and 14 depend from claim 12. As discussed above, the Camp reference is deficient in that it does not teach all the elements of the base claims 1 and 12. In summary, the power amplifier of Camp that is fed by the feedback loop is purposefully operated at saturation (and thus there is no control signal used to operate the power unit below saturation, as claimed), and the driver stage for that power amplifier is not within the feedback loop. The proposed combination with Chen does not cure these severe underlying deficiencies.

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Moreover, the Examiner has not provided adequate reason to implement the asserted combination. In this regard, the Supreme Court has recently noted:

Although common sense directs one to look with care at a patent application that claims as innovation [***38] the combination of two known devices according to their established functions, it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does. This is so because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known.

KSR Int'l Co. v. Teleflex Inc., 127 S. Ct. 1727, 1741 (U.S. 2007)

The Examiner argues that the invention recited by Appellant in claims 2, 3, 13 and 14 will result by simply adding the variable gain preamplifier disclosed by Chen (see Chen Fig. 2) into the circuit disclosed by Camp. According to the Examiner, such a modification of Camp will control the appropriate amount of gain to supply the driver circuit of the system. First, power amplifier 32 of Camp is always driven at saturation, so controlling the gain in the manner suggested by the Examiner will have no consequence. For example, applying the proposed gain adjustment at the power amplifier stage 32 is illogical because the amplitude modulation scheme of Camp requires that power amplifier 32 operate in saturation. Alternatively, if the proposed gain adjustment was inserted at the RF driver stage 30, the gain adjustment would be outside of the feedback loop, and the power amplifier 32 would be driven at saturation anyway. Furthermore, Appellant submits that Camp already discloses that the signal provided by the RF driver stage 30 (see Camp Fig. 4 and accompanying discussion), which is used to drive the power amplifier 32, can be adjusted.

Accordingly, the Examiner's proposed combination would not be implemented by the skilled artisan and such an asserted combination would not result in the invention recited by claims 1 and 12 because there is nothing disclosed by Chen that would overcome the fatal deficiencies of Camp with respect to the underlying recitations of claims 1 and 12. The § 103(a) rejection of claims 2-3 and 13-14 over Camp in view of Chen should be reversed.

D. Rejection of claim 6 under 35 U.S.C. § 103(a) over Chen in view of Ichikawa

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Claim 6 cannot be said to be obvious over Chen in view of Ichikawa because Ichikawa does not cure the underlying deficiencies of the Chen reference with respect to claim 4 (from which claim 6 depends). In at least this regard, the rejection of claim 6 fails to state a *prima facie* case of obviousness, and should be reversed.

E. Rejection of claims 7 and 17 under 35 U.S.C. § 103(a) over Chen in view of Tsuji

Claims 7 and 17 cannot be said to be obvious over Chen in view of Tsuji because the Examiner has failed to establish a *prima facie* case of obviousness by failing to demonstrate that the Chen reference teaches or suggests all the limitations of either claim 1 or claim 12 (from which these claims depend) as required (see M.P.E.P. § 2142). As discussed above in relation to the § 102(b) rejections of claims 8, 18, and 20, the Examiner simply states that "Chen discloses the method of claim 1 and 12" without providing any demonstrable correspondence between the Chen reference and the recitations of claim 1 or claim 12 (recall that claims 1 and 12 were rejected in view of Camp, not Chen). As such, the § 103(a) rejection of any claim (based upon the Chen reference) that depends from claims 1 or 12 is improper and should be reversed.

F. Rejection of claims 9-10 and 19 under 35 U.S.C. § 103(a) over Chen in view of Nishihori

Claims 9-10 and 19 cannot be said to be obvious over Chen in view of Nishihori because the Examiner has failed to establish a *prima facie* case of obviousness by failing to demonstrate that the Chen reference teaches or suggests all the limitations of claim 1 (from which these claims depend) as required (see M.P.E.P. § 2142). As discussed in Section E of Appellant's Argument, the § 103(a) rejection of any claim (based upon the Chen reference) that depends from claim 1 is improper and should be reversed.

G. Rejection of claim 11 under 35 U.S.C. § 103(a) over Chen in view of Kurokawa

Claim 11 cannot be said to be obvious over Chen in view of Nishihori because the Examiner has failed to establish a *prima facie* case of obviousness by failing to demonstrate that the Chen reference teaches or suggests all the limitations of claim 1 (from which this

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APPENDIX OF CLAIMS INVOLVED IN THE APPEAL
(S/N 10/527,775)

1. A method for preserving linearity of a RF power amplifier, the power amplifier including a RF power output unit having a characteristic drive level and fed by a supply voltage, comprising:
 - measuring the output voltage of the RF power output unit;
 - comparing the measured output voltage to at least one threshold voltage to produce a control signal; and
 - reducing the drive level or increasing the supply voltage of the RF power output unit by means of the control signal to operate the output unit below its saturation level.
2. The method of claim 1, wherein the power amplifier includes a variable gain preamplifier supplying the drive voltage to the RF power output unit and wherein the control signal is used to adapt the gain of the preamplifier.
3. The method of claim 2, wherein the control signal is combined with the gain control signal of the preamplifier.
4. A method for controlling an antenna circuit comprising a RF power amplifier and a matching circuit by preserving linearity of a RF power amplifier, the power amplifier comprising a RF power output unit having a characteristic drive level and fed by a supply voltage source, comprising:
 - measuring the output voltage of the RF power output unit;
 - comparing the measured output voltage to at least one threshold voltage to produce a control signal; and
 - adapting the output matching circuit by means of the control signal to operate the output unit below its saturation level.

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5. The method of claim 4, wherein the adapting of the output matching circuit is done by changing either a magnitude or a phase of an impedance transform function.
6. The method of claim 4, wherein the adapting of the output matching circuit and the adapting of the supply voltage are combined with a power amplifier efficiency optimization in case of a multiple threshold detection by an analog-to-digital converter.
7. The method of claim 1, wherein the output voltage of the RF power output unit is rectified before being compared to the threshold voltage.
8. The method of claim 1, wherein the output voltage of the RF power output unit is compared to the threshold voltage by means of an operational amplifier.
9. The method of claim 8, wherein the output voltage of the RF power output unit is compared in at least two parallel operational amplifiers to threshold voltages to produce at least two control signals, and wherein the at least two control signals are fed to a base-band controller.
10. The method of claim 9, wherein the at least two threshold voltages have different voltage levels.
11. The method of claim 1, wherein the supply voltage is adapted by a programmable DC-DC converter controlled by a base-band controller which is fed by the control signal.
12. A circuit for preserving linearity of a RF power amplifier wherein the power amplifier includes a RF power output unit having a characteristic drive level, comprising
 - a measuring unit measuring the output voltage of the RF power output unit;
 - a comparing unit comparing the measured output voltage of the RF power output unit to a threshold voltage to produce a control signal;

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a drive level adaptation unit reducing the drive level of the RF power output unit or a supply voltage adaptation unit increasing a supply voltage of the RF power output unit to operate the output unit below its saturation level for preserving linearity of the RF power amplifier.

13. The circuit of claim 12, wherein the power amplifier includes a variable gain preamplifier supplying the drive voltage to the RF power output unit; and wherein the control signal is fed from the comparing unit to the preamplifier to adapt the gain of the preamplifier.

14. The circuit of claim 13, comprising a combining circuit between the comparing unit and the preamplifier combining the control signal with the gain control signal of the preamplifier.

15. A circuit for stabilizing an antenna circuit comprising a RF power amplifier and a matching circuit, wherein the RF power amplifier comprises a RF power output unit having a characteristic drive level, comprising

a measuring unit measuring the output voltage of the RF power output unit;
a comparing unit comparing the measured output voltage of the RF power output unit to a threshold voltage to produce a control signal; and

a drive level adaptation unit adapting the output matching circuit by means of the control signal thereby adapting the drive level of the RF power output unit to operate the RF output unit below its saturation level for preserving linearity of the RF power amplifier.

16. The circuit of claim 15, wherein the output matching circuit is configured to be adaptable with respect to either a magnitude or a phase of its impedance transform function.

17. The circuit of claim 12, comprising a rectifier between the RF power output unit and the comparing unit.

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18. The circuit of claim 12, wherein the comparing unit comprises an operational amplifier.

19. The circuit of claim 18, comprising at least two parallel operational amplifiers to produce at least two control sub-signals, and wherein the at least two control sub-signals are fed to a base-band controller to adapt the gain of the RF power output unit to adapt the gain thereof.

20. An apparatus comprising a circuit as claimed in claim 12.

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APPENDIX OF EVIDENCE

Appellant is unaware of any evidence submitted in this application pursuant to 37 C.F.R. §§ 1.130, 1.131, and 1.132.

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APPENDIX OF RELATED PROCEEDINGS

As stated in Section II above, Appellant is unaware of any related appeals, interferences or judicial proceedings.